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ABSTRACT

Students learn to practice safe behavior most effectively when they are actively involved in the process of identifying and controlling hazards. This article focuses on a problem faced by many urban-based schools--pedestrian safety. Hazard identification projects can be used to train students to develop practical, effective hazard controls. The purpose of this hazard surveillance study was twofold: (1) to identify hazards to pedestrian safety and (2) to involve students in a class project that would result in the development of hazard control measures. The project was implemented on a university campus and attempted to determine pedestrian crosswalk utilization rates at 15 campus-based sites. A geodemographic data collection protocol was designed to allow student observers to record vehicular and pedestrian traffic at the varied sites. Results indicated that a number of specific unidentified pedestrian hazards existed on the campus. Students used these data to develop varied approaches to hazard control including documentation, presentations to campus-based groups, and methods designed to support the development of a computer-based accident/injury data base. Graphs presenting data are included. (Author/ND)

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Teaching About Hazard Identification and Injury Control: A Student-based Project Focusing On Pedestrian Safety

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Abstract: Learning must be more than a passive review of information. This is especially true of curricular units that deal with safety issues. Students learn to practice safe behavior most effectively when they are actively involved in the process of identifying and controlling hazards. This article focuses on a problem faced by many urban-based schools, pedestrian safety. Hazard identification projects can be used to train students to develop practical, effective hazard controls. The purpose of this hazard surveillance study was twofold: (1) to identify hazards to pedestrian safety and (2) to involve students in a class project that would result in the development of hazard control measures. The project was implemented on a University campus to determine pedestrian crosswalk utilization rates at 15 campus-based sites. The results were used to develop a campus-wide injury control policy. The nature of the problem was to design a geodemographic data collection protocol that would allow student observers to record vehicular and pedestrian traffic at the varied sites. Results indicated that a number of specific unidentified pedestrian hazards existed on the campus. Students used these data to develop varied approaches to hazard control including documentation, presentations to campus-based groups and methods designed to support the development of a computer-based accident/injury data base.

Key Words: Pedestrian Safety, hazard surveillance, injury control

Teaching About Hazard Identification and Injury Control: A Student-based Project Focusing On Pedestrian Safety

Introduction

Learning must be more than a passive review of information. This is especially true of curricular units that deal with safety issues. Students learn to practice safe behavior most effectively when they are actively involved in the process of identifying and controlling hazards. This article focuses on a problem faced by many urban-based schools, pedestrian safety. Students need to be taught how to use crosswalks in a safe manner. This article offers an overview of procedures that can help teachers in developing a student-centered pedestrian safety project that has practical value to students and communities alike.

Many schools exist in urban areas that undergo high utilization at specific times of the day (Figure 1), is used by a large number of pedalcyclists, has copious vehicular traffic and is often characterized by a building density that is constantly being used by a large number of pedestrians. More than half of all motor vehicle accidents that involve pedestrians occur when they enter or attempt to cross streets.[1] Vehicle/pedestrian accidents (Figure 2) are the result of the interaction of a varied and complex number of factors such as individual perception,

driving behavior, roadway environment and pedestrian behavior. Prevention of injury due to these types of accidents must focus on identification of hazards created by these factors. This project was implemented by college students on a University campus. It focused on a specific factor related to motor vehicle accidents that involve pedestrians, specifically, campus crosswalks. This project can also be a value experience for Junior High and High students, especially in schools in urban areas where many students may walk to school.

Background and Significance

This project involved a geodemographic hazard survey on a college campus. However, the ideas and procedures involved in the development, implementation and evaluation of the project can be applied in almost any environment where crosswalks exist. Specifically, college/university campuses are micro communities, have many characteristics of urban population centers and as such share several common hazard-related characteristics. First, there is an excess of vehicular traffic that is confined to a comparatively small land area. Second, there are unusually large numbers of pedestrians present at specific times of the day when typically, the largest number of vehicles are using the roads. Finally,

those roads are narrow and include a high number of crosswalks that are not necessarily found just at intersections. Clearly, the campus environment contains a multiplicity of hazards that may contribute to vehicular/pedestrian accidents.

"The National Highway Traffic Safety Administration reports (Figure 3) that in 1993, 5,546 pedestrians were killed in traffic crashes in the United States. On average, a pedestrian is killed in a traffic crash every 93 minutes and 70 percent of those fatalities (Figure 4) are male." [2] Characteristically, 69 percent of pedestrian fatalities in 1993 occurred in urban areas. Further, many fatalities occurred at non intersection locations (81 percent), in normal weather conditions and at night. [2] Clearly, because all universities have buildings that allow for crossings at non intersection locations, in varied weather conditions throughout the year, day and night; college campuses have an inordinate number of pedestrian hazards.

Purpose of the Study

The purpose of this descriptive study (Figure 5) was to identify existing campus-based pedestrian hazards. The goals of the project were twofold: (1) to determine student/pedestrian crosswalk utilization rates

at 15 campus-based sites and (2) to involve students in data collection, management and analysis. The nature of the problem (Figure 6) was to design an unobtrusive data collection protocol that would allow student observers to record vehicular and pedestrian traffic at the varied sites.

Data were collected by undergraduate students enrolled in a Safety Management course. In part, course content focuses on campus-based safety management including the rules that govern use of campus crosswalks. Participation in the data collection served to support course content in addition to involving students in reality-based hazard control procedures.

The University Site

This project was developed, implemented and evaluated at a State University in the southeastern region of the United States near a large city with a metropolitan population of approximately 1.2 million. Data were collected in the 1995 Fall semester. At the time, the student body consisted of 15,800 undergraduate and graduate students and 1,783 faculty and staff. There were 12,412 registered vehicles on a campus covering a land area of approximately 1,000 acres with five main roadways. In addition to campus-based dormitories, there are two large

residential areas adjacent to the campus that contributed to the volume of pedestrian traffic.

Because a majority of pedestrian/vehicle accidents occur at crossing sites, campus crosswalks were assumed to represent the most hazardous places on campus. Identification of the most hazardous crossings would allow for the design of an effective approach to pedestrian injury control.

Methods

Teachers should begin by identifying crosswalks near the school. Choose sites that can be observed from a safe distance. Students should be trained to work in teams of two. The most effective training method is to video tape a team making observations. This controlled example will show how the observer and recorder must work together. Observations involve making tick marks as pedestrians and vehicles pass through the crosswalk. Observations (number of vehicles, pedestrians and/or confrontations) made at specific sites can be used to determine the relative risk involved when using the crosswalk. These totals are affected by volume of traffic, building density and physical characteristics such as signs and bushes which block lines of sight for pedestrians and drivers

alike. Teachers can use totals to assist students in the development of risk values for each site. Statistical procedures can be used to determine the relationships existing among the sites. Using the campus-based project, a more specific explanation of the methods employed follows.

Observations were conducted at 15 campus-based sites during time slots that coincided with the changing of classes. Data were collected Monday through Friday over a period of two non continuous weeks by teams of undergraduate students enrolled in a Safety Management class. Students were educated about pedestrian safety, hazard identification, injury control and the specifics of crosswalk safety. Data were collected by "teams" (one observer and one recorder), for periods of one hour, using a data collection instrument developed by the authors (Figure 7). Observers, who were stationed at unobtrusive positions adjacent to crosswalks counted the number and type of traffic variables that went through each crosswalk. Observers made note of the following: pedestrians, private cars, security vehicles, maintenance golf carts, university cars, motorcycles, runners, walkers, rollerbladers and pedalcyclists. Observers made note of "confrontations" which could potentially result in an accident (a confrontation was operationalized as any situation when the "right of way" was not properly used). The rule of thumb for the "right of

way" at a crosswalk was operationalized in the following manner: (1) if a pedestrian is already within the confines of the crosswalk as a car approaches, the vehicle must slow and/or stop to yield and (2) if an approaching vehicle is within four car lengths (given speed and momentum) the pedestrian should wait at the curb and allow the car to pass.

Additional observations were made to supplement the data collection. A "Jugs" radar gun was used to determine the speed of cars at various sites on campus roadways. Observations were made on two separate days (1 - 3 P.M.) during the two-week period that the crosswalk data were being collected.

Data Analysis

Data were coded into the following categories: Group 1 (Pedestrians): runners, walkers and pedestrians, Group 2 (Vehicles): private cars, security vehicles, maintenance golf carts, university cars and motorcycles, Group 3 (Agents of Injury): rollerbladers and pedalcyclists. In order to facilitate analysis, the 15 crosswalk sites were placed into six continuous groups based on campus locations. Thereafter, a

relative risk value for each site was generated by developing an equation composed of Group 1-3 variables (Vehicles x Pedestrians x Agents x Confrontations divided by four) and the number of confrontations observed at each site. Data were analyzed by using a Chi Square procedure (Risk value by site) in order to determine if statistically significant differences existed among the 15 campus-based sites. Thereafter, the risk values were used to develop a rank order of crosswalk sites according to risk to pedestrians.

Results

A total of 11,294 private cars and 7,850 pedestrians (Figure 8) passed through the crosswalks being observed (in addition to private cars: 263 University cars, 315 golf carts, 112 security vehicles, 24 motorcycles, 108 runner/walkers and 10 rollerbladers). A large number of (460) pedalcyclists were seen to pass through the crosswalks; very few riders were wearing helmets. A total of 180 confrontations was recorded during the observations. Crosstabs analysis (Figure 9) revealed that there were statistically significant relationships between the sites relative to the risk value determined by the equation (X^2 p = .04). Review of the speed data revealed that 920 vehicles had been observed traveling at an

average speed of 28. 4 mph (Range: 26 to 33 mph). The campus speed limit is posted at 25 mph.

Discussion

The campus site used in this project is a micro community with an average amount of building density that requires that students cross a number of streets when moving to and from classes. Recent on-campus construction had created yet another hazard for pedestrians and private cars alike. Results indicated that significant relationships existed between crosswalk sites and their risk values as determined by observations and the resulting equation. Thereafter, it was possible to rank order crossings that posed a hazard to student pedestrians (Figure 10). There were a large number of confrontations between pedestrians, vehicles and pedalcyclists. In addition, at specific places on campus, speeding vehicles created an additional hazard for pedestrians and pedalcyclists alike.

Conclusions and Recommendations

As the population of urban areas continue to grow, specific

pedestrian hazards become more numerous and students walking to and from school are placed at greater risk. Data from this campus-based study indicated that large numbers of pedestrians and vehicles pass through campus crosswalks and there are a large number of confrontations. In addition, pedalcyclists were more numerous than expected; very few riders were wearing helmets.

Effective injury control measures must focus on the identification of hazards and motivating students to comply with safety mandates before injuries occur. Based on the data collected during this study and the conclusions of other researchers, students were able to develop the following initiatives (Figure 11). First, assuming that all university campuses share pedestrian hazards discovered by this study, the situation calls for a campus wide Crosswalk awareness and information programs which: (1) identifies campus crosswalks as "hazardous," and (2) focuses on the rules that govern crosswalk utilization. Project representatives made a presentation to the Student Legislature and argued for the sponsorship of an awareness program that would serve to develop interventions that: (1) Set up pedestrian safety presentations in all campus residents' halls and (2) create campus-based pedestrian seminars for students living in off-campus housing and commuter students.

Second, students developed an informational "Crosswalks: Rules of the Road" trifold that could be made available to all owners of vehicles registered on campus. This brochure provided an overview of campus roadways, speed limits, crosswalk sites and related hazards in addition to outlining the rules governing crosswalk use from both a pedestrian and driver point-of-view.

Third, Van Houten [3] found that the introduction of prompts in the form of specific signs resulted in an 80 percent reduction in motor vehicle/pedestrian conflicts. Therefore, students created examples of visible signage that could be employed to remind pedestrians and drivers to use caution when crossing campus streets. A simple golf tee marker configuration provided a warning (Cross with Caution) that could be placed at all crosswalks to remind pedestrians to be "defensive" when crossing the street.

Fourth, of all the deaths occurring as a result of vehicle/pedestrian crashes, "50 percent (mostly male ages 15 to 30) are due to head injury."[4] In 1992, 716 pedalcyclists were killed in crashes with vehicles and fifty-one percent of those deaths involved riders 21 years and older. [5] Medical records indicate that one fourth of student pedalcyclists from the University of Wisconsin had experienced a mishap in the preceding three

years and 67 percent of this group had sustained at least one injury. [6] Fullerton and Becker [7] studied the bicycle habits of 100 university students and found that helmet ownership and use was most strongly associated with previous injury. Mortality data suggest that, if head injuries could be averted, many otherwise fatally injured pedalcyclists would survive.

Injury prevention efforts must focus on compliance with helmet use before injury occurs. Consequently, students focused on the development of a campus-based helmet awareness campaign. Because mandatory helmet use on campus can be an effective control measure, school administrators were asked to consider legislation requiring that pedalcyclists wear a helmet while riding on campus.

Fifth, a major four lane highway runs adjacent to the main entrance of the campus that served as the site of this study. Although this crossing was not identified as the most dangerous, students gave special consideration to developing a proposal that would result in the construction of an overhead walkway to be used by pedestrians and pedalcyclists. This would serve to eliminate a pedestrian hazard and allow for the improved flow of traffic past the entrance of the University.

Finally, although most University Police & Public Safety Offices

maintain accident reports, specific data relative to pedestrians and accidents involving vehicles, often are not kept on-file. Students proposed that a computer database be created for the purpose of monitoring campus-based pedestrian hazards and resulting accidents. The data may be collected, managed, analyzed and disseminated by students as a part of an ongoing injury prevention project involving the combined efforts of the Student Government, Student Health Center, and the Police/ Public Safety Office.

Summary

Data collected within the context of this project indicated that a number of pedestrian hazards existed on the campus site. Speeding vehicles needed to be brought under control. High concentrations of pedestrians and equally high volumes of vehicular traffic contributed to hazardous conditions. The existence of an unusually high number of pedalcyclists created another hazard for both drivers and pedestrians.

Students who made the observations assisted in the development of a number of initiatives that would ameliorate existing hazards and problems. Data were made available to the Student Legislature and the Vice Chancellor for Student Affairs and were accompanied by a list of

recommendations. Students lobbied for collaboration among concerned campus-based groups arguing that this approach could create a low cost, effective programmatic intervention that focuses on pedestrian safety. The potential benefits to be derived from this collaboration would be realized in terms of effective hazard control and reduced potential for injuries or fatalities due to accident. Implementation efforts are currently being undertaken.

Students benefitted from the involvement and the action orientation inherent in this project. They also learned valuable lessons associated with data collection and analysis. What is most important, they were able to contribute to improving the safety of their campus environment. This type of student project can be developed on any school-site that has pedestrian crosswalks. It can serve as a unique opportunity for students to learn and contribute to the improvement of student safety. Those interested in more details about aspects of this project may contact the authors.

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Pedestrian Safety: Hazard Identification

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- **Cross walk Safety**
- **Geodemographics**
- **Injury Statistics**
- **Hazard Surveillance**
- **Hazard Control**
- **Injury Prevention**

Figure 1

Safety Management:

Pedestrian Safety

- **Rationale: vehicular and pedestrian traffic around schools creates hazards and increases the potential for accidents and injuries.**

Pedestrian Injury

Figure 2

- 89,000 pedestrians sustained injuries in motor vehicle collisions during 1992.
- Almost 82% of all pedestrian deaths occurred at non intersection locations in 1992.
- More than 37% of pedestrians killed were crossing improperly.
- More than half of all deaths and injuries occur when pedestrians cross or enter streets.
- More than 73% of fatal pedestrian/vehicle collisions occurred in urban areas.
- About 73% of pedestrian/vehicle crashes involve passenger cars.

Figure 3

Traffic Safety Facts* 1992-93

U.S. Department of Transportation
National Highway Traffic Safety Administration

- 5,546 pedestrians died in traffic crashes.
- Pedalcyclist deaths accounted for 2 percent of all traffic fatalities.
- Only 20% of respondents from Public Health agencies in twenty states listed pedestrian safety as a top three priority issue.
- 40% of the same respondents listed data collection as a key strategy in the improvement of highway safety.

Figure 4

Pedestrian Safety

Network Of Employers for Traffic Safety

- The second largest category of motor vehicle deaths, after occupant , is pedestrians.
- Since 1982, 14-17 percent of all traffic deaths have been pedestrians.
- Seventy percent of pedestrian deaths are males.

- Pedalcyclists
  - In 1992, 716 bicyclists were killed in crashes with vehicles.
  - Fifty-one percent of bicyclist deaths in 1992 involved riders 21 years and older.

Figure 5

Purpose of the Study

- **The purpose of this descriptive study was to identify existing campus-based pedestrian hazards.**
- **The goals of the project were twofold:**
  - **1. to determine student/pedestrian crosswalk utilization rates at 15 campus-based sites.**
  - **2. to involve students in data collection for the purpose of supporting course content.**

Figure 6

The Problem

The nature of the problem was to design an unobtrusive data collection protocol that would assist student observers in identifying pedestrian safety risks and related campus-based hazards.

Accurate assessment of these variables may serve to shed light on the relationship between knowledge of existing rules which govern pedestrian safety and practice in the area of campus-based safety management.

Figure 7
Cross Walk
DATA REPORT CARD

Please use this card to record information about the cross-walks you have observed. Please make a record of the events you observed during the hour you have been monitoring this site. On the back of this card, make one (1) tick mark for each time you observe a particular event. Return your completed report card to your Lab instructor. Report any problems or hazards that you may observe by writing a description on the bottom of the card. Thank you for your participation.

Date of Observation_____ Lab # _____

Site # _____ Date _____

TEAM #_____ Time: From_____To _____

Name (observer) _____ (recorder) _____

Safety Tips for Volunteers

1. Wear appropriate clothing relative to the weather conditions.

2. Remain unobtrusive. Observe from a distance. Never sit or stand directly adjacent to the cross-walk.

3. The first rule of data collection is to decide the best and most efficient way to collect the necessary data. Work as a team. One observer who calls out information and one recorder who marks the data card usually works best.

4. Do not discuss the project with anyone. If a pedestrian asks what you are doing, simply say, "I'm working on a class assignment about campus traffic.

5. Be specific about marking the data card. This is IMPORTANT! Place totals in the correct box.

You may find it helpful to assist each other as you observe each event at your cross-walk site. An easy way to keep track of the events is by making tick marks. The box is for total items; see example below. Take your time and record events in an efficient manner. Thank you!

Example:

	TOTAL		TOTAL
# of Cars ////	4	# of Pedestrians ///// /////	10

# of CARS _____ ☐

# of Pedestrians _____ ☐

# of BIKERS _____ ☐

# of University Vehicles _____ ☐

Golf Carts _____ ☐

# of Security Cars _____ ☐

# of Roller Bladers _____ ☐

# of Runners/Walkers _____ ☐

# of Motor Cycles _____ ☐

# of Confrontations _____ ☐

Figure 8

Campus-based Observations: X - Walk Utilization

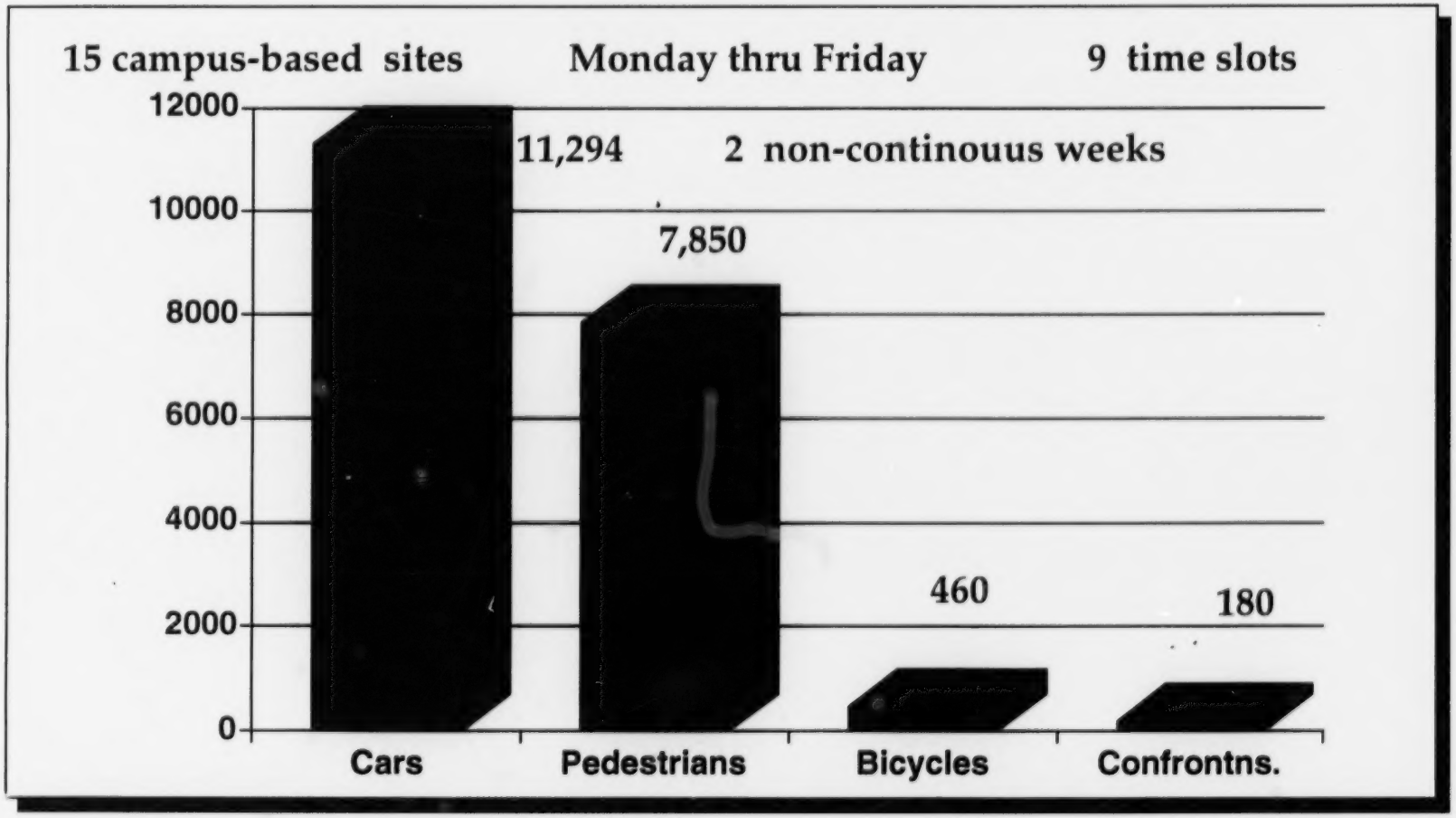


Figure 9

Campus Crosswalk Sites by Risk Value*

($X^2 = 25.57$ df = 15 p = .04)

*Vehicles x Pedestrians x Agents x Confrontations / 4 = Risk

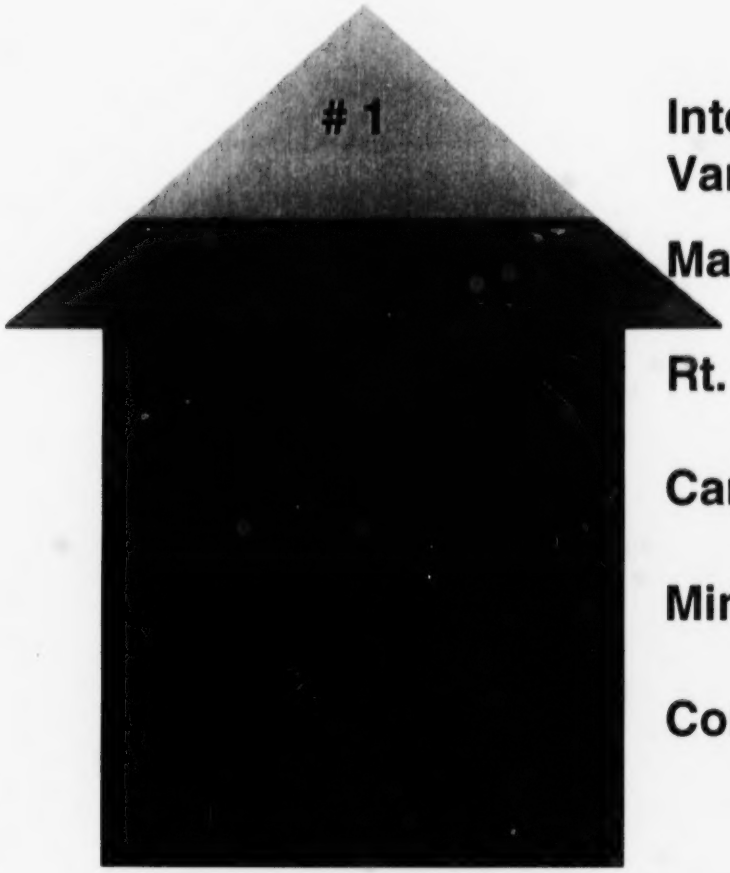
Group 1 Vehicles:
Cars + Golf Carts + Security Cars + Motorcycles

Group 2 Pedestrians: Runners + Walkers + Pedestrians

Group 3 Agents: Pedalcyclists + Roller Bladers

Crosswalk Relative Risk Ranking by Site

Figure 10



Intersection @ Mary Alexander VanLandingham Roads

Mary Alexander Rd. Dorms

Rt. 49 Entrance

Cameron Center Crossing

Miner Statue Crossing

Cone Center Parking Deck Crossings

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Student Recommendations

Figure 11

Cross with Caution

- **Campus Awareness Program**
  - Pedestrian Safety: Crosswalks
- **Trifolds for Registration**
  - "Crosswalks: Rules of the Road"
- **Signage at all crosswalks**
- **Updated Campus map**
- **Mandated Helmet use**
- **Pedestrian Overpass**
- **Campus-based Accident Database**

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